SUPPLEMENT

PROCEEDINGS OF THE SIXTH ANNUAL MEETING OF THE AMERICAN INSTITUTE OF NUTRITION

KING EDWARD HOTEL, TORONTO, APRIL 26, 1939

The sixth annual meeting of the American Institute of Nutrition was held in Toronto at the King Edward Hotel on April 26, 1939. Ninety-four members and 420 guests registered, but there were approximately 800 in attendance during the scientific sessions.

COUNCIL MEETING

The Council meeting was held at the King Edward Hotel Tuesday afternoon, April 25th, 2.00 P.M. All members were present. Formal actions of the Council are reported in the minutes of the general business session.

SCIENTIFIC SESSIONS

President E. V. McCollum presided at the first scientific session and at the business meeting. Vice-president T. M. Carpenter presided at the second scientific session. The scientific program was begun at 9.30 A.M., April 26th, and proceeded on schedule time. All the papers listed on the program were given.

The Symposium program held on the evening of April 26th under the chairmanship of President McCollum, was attended by over 800 persons. All of the papers had been very carefully prepared by the speakers and their presentations held the very close attention of the large audience. From the comments received it was evident that this program proved one of the most attractive features of the annual meeting.

BUSINESS SESSION

The business meeting convened at 11.30 A.M., April 26th, and was called to order by President McCollum. The reading of the minutes of the previous annual meeting was dispensed with since they had been published in the Journal.

In accordance with the by-law providing that members in good standing who have reached the age of 65 years shall become emeritus members, it was announced that Paul Roth has attained this rank of service.

The report of the treasurer was read by George R. Cowgill. The auditors, W. H. Sebrell and H. W. Titus, previously appointed by the President, reported that they had examined the treasurer's books and found them correct. It was moved by P. E. Howe and seconded by Helen S. Mitchell that the report of the treasurer be accepted. The motion carried.

The Council recommended to the members that the annual dues for 1939–1940 be $1.00 and the registration fee for the 1940 meeting be 50 cents. It was so moved by G. R. Cowgill and seconded by W. H. Sebrell. The motion carried.

The Council recommended that the following candidates be elected to membership in the American Institute of Nutrition:

Paul Gyorgy	Elizabeth C. Robertson
J. S. Hughes	Susan G. Smith
E. L. Sevringhaus	Elizabeth Neige Todhunter

A. H. Smith moved and H. D. Branion seconded that the secretary cast a unanimous vote for the election to membership of the candidates approved by the Council. The motion carried and the secretary declared the candidates duly elected members of the American Institute of Nutrition.

J. R. Murlin reported informally as Editor. The items mentioned in his report are covered in the formal report of the Editorial Board which is included later.

G. R. Cowgill reported for the committee appointed to draw up regulations for the administration of the Mead Johnson and Company Award for Research on the vitamin B complex. The secretary called attention to the public announcement of the principles governing the award as published in the Journal,

vol. 16, p. 621, 1938, and enumerated certain other regulations which had been approved by the Council. On motion by L. C. Norris the principles outlined were approved. As a matter of record the detailed statement approved by the Council is included in these minutes.

The Mead Johnson and Company Award for Research on the Vitamin B Complex

G. R. Cowgill as chairman of the committee consisting of L. A. Maynard, C. A. Elvehjem, Icie Macy Hoobler, and A. G. Hogan, reported on the work of the committee in formulating the principles for the administration of the Mead Johnson and Company Award. (The report of this committee was circulated to the Council in November, 1938 and was approved by a mail vote. See attached sheets.) The secretary read the following statement based upon the above report, which had been transmitted to the Committee of Judges and which was published in part in the Journal (*16*, 621, 1938) and elsewhere as a public announcement:

Statement Regarding the Administration of the Mead Johnson and Company B Complex Award

In order to promote interest in researches dealing with the water-soluble B-complex vitamins, Mead Johnson and Company have established an annual award of $1000.00 to be given over a period of 5 years through the medium of the American Institute of Nutrition. The Institute, through an appropriate Committee of Judges selected from its membership, will name the recipient of this Award; the formal presentation of it will be made as part of the program of the annual meeting held each spring.

The Award will be given to the laboratory (non-clinical) or clinical research worker in the United States or Canada who, in the opinion of the judges, has published during the previous calendar year January 1st to December 31st, the most meritorious scientific report dealing with the field of the B-complex vitamins. While the award will be given primarily for publication of specific papers, the judges will be given considerable latitude in the exercise of their function. If in their judgment circumstances and justice so dictate, it may be recommended that the prize be divided between two or more persons. It may also be recommended that the award be made to a worker for valuable contributions over an extended period but not necessarily representative of a given year. Membership in the American Institute of Nutrition is not a requisite of eligibility for the award.

A Committee of Judges consisting of five members of the Institute will be appointed annually by the President to recommend to the Council a recipient for the award. To assist this committee in its deliberations nominations will be solicited by the Secretary of the Institute by means of public announcements and by a note in the annual letter to members. Such nominations may be sent to the Secretary at any time for transmissal to the Committee of Judges, but for a nomination to be

considered for the award to be bestowed at any given spring meeting of the Institute, however, it must be received by the Secretary not later than January 15th. The nomination should be accompanied by such data relative to the nominee and his research as will facilitate the task of the Committee of Judges in its consideration of the nomination. In addition to the investigation of the merit of nominations thus made it will be the duty of the Committee to search the literature on its own account in arriving at its selection of a recipent for the Award. The personnel of the Committee will be kept confidential until its deliberations are finished.

The name of the nominee selected by the Committee of Judges should be sent to the Secretary of the Institute as soon as possible after January 15th. This nomination will then be submitted to the Council for ratification and thereafter the nominee will be notified in order that he may make plans for being present at the annual meeting. The name of the nominee will be kept confidential by all concerned until the announcement is made at the annual dinner, at which time the Award will be bestowed by the President of the Institute. The recipient will be expected to make a brief response.

It is a very definite desire of both the donor and the Council that the award be made annually. In accepting the award, the Council specified that the field covered should be broad enough so that there should be no question about finding a meritorious contribution and recipient annually. It has been understood with the donor, however, that the Institute will not be expected to make the Award for definitely mediocre work. Thus, the Council is prepared to consider the withholding of the Award in any given year if it is the carefully considered judgment of the Committee of Judges that this should be done.

In addition to the purse provided by Mead Johnson and Company the recipient will be presented with a simple scroll as a memento of the occasion, the cost to be defrayed by the Institute.

This statement was approved by the Council on the motion of G. R. Cowgill, seconded by P. E. Howe, and it was voted to recommend its adoption by the Institute as a basis for future awards. As a matter of record, President McCollum reported the appointment of the following Committee of Judges for the 1938–1939 award: G. C. King, chairman, W. C. Rose, H. B. Lewis, Helen T. Parsons, F. F. Tisdall.

The Secretary announced that in addition to the purse of $1000 Mead Johnson and Company had agreed to provide a sum of $100 annually for the traveling expenses of the recipient.

The Council recommended that the Institute hold its 1940 meeting on the day prior to the meetings of the Federation. This recommendation was adopted on the motion of A. G. Hogan, seconded by E. M. Nelson.

President McCollum appointed the following nominating committee for 1939–1940: W. C. Russell, chairman, P. L. Day, Agnes Fay Morgan, F. F. Tisdall, H. W. Titus.

The Secretary presented a communication from R. G. Harrison, Chairman of the National Research Council, relative to the Sixth Pacific Science Congress to be held in California July 24 to August 12, 1939. By request of the secretary, Agnes Fay Morgan made a statement regarding the purpose and program of this Congress. It was moved and carried that the incoming president be requested to appoint certain members of the Institute as its representatives to this Congress, in accordance with the request in the letter from Doctor Harrison.

President McCollum asked the tellers, E. M. Nelson, chairman, and A. G. Hogan, to report on the count of the ballots for the election of officers for 1939–1940. The results were as follows: President, H. C. Sherman; Vice-President, T. M. Carpenter; Secretary, L. A. Maynard; Treasurer, G. R Cowgill; Councilor, A. H. Smith; Associate Editors, Icie Macy Hoobler, H. A. Mattill, H. H. Mitchell.

It was moved by Helen S. Mitchell and seconded by L. C. Norris that the secretary be instructed to extend for the members of the American Institute of Nutrition and their guests their sincere thanks to the local committee and the management of the King Edward Hotel for the excellent arrangements provided for the meeting and for the many courtesies extended.

LUNCHEON

The noon luncheon in the Alexandra Room of the King Edward Hotel was attended by 217 members and guests.

DINNER

The subscription dinner held in the Alexandra Room of the King Edward Hotel was attended by 286 members and guests.

The Mead Johnson and Company Award for Research on the Vitamin B Complex for 1939 was presented by President McCollum to Conrad Arnold Elvehjem, Professor of Biochemistry, University of Wisconsin. In addition to the purse

of $1000 provided by the Mead Johnson Company, Doctor Elvehjem was presented with a scroll which stated the basis of the Award in the following words "In recognition of his outstanding research accomplishments in relation to the vitamin B complex, particularly the importance of nicotinic acid and related compounds in nutrition."

In making the presentation President McCollum paid tribute to the generosity of the Mead Johnson Company in providing the Award and expressed the belief that it would serve an important purpose in stimulating research in nutrition. In response Doctor Elvehjem expressed his gratitude for the Award, described briefly the work which led up to his discoveries and paid tribute to his teachers who had inspired him and to his colleagues who had been associated with him in the work.

Sir John Boyd Orr, director of the Rowett Institute, Aberdeen, Scotland, a special honor guest at the dinner, was called upon and spoke briefly regarding the importance of nutrition research and brought greetings from the nutrition workers in the British Empire.

EDITORIAL BOARD MEETING

The Editorial Board met at the King Edward Hotel at the dinner hour on April 27, 1939. Present were J. R. Murlin, A. H. Smith, Grace MacLeod, J. B. Brown, E. M. Nelson, L. H. Newburgh, H. A. Mattill, G. R. Cowgill and A. G. Hogan. After considerable discussion regarding the acceptance of papers from foreign contributors it was voted that a limited number of such papers of outstanding merit may be accepted for publication beginning with volume 18. The number accepted should be left to the discretion of the editor depending on the pressure of publication from contributors from the U. S. and Canada. As a guiding figure it was suggested, though not formally adopted, that not more than 5% of the total number of papers appearing in any volume should be from foreign contributors.

The editor presented again the possible necessity of publishing three volumes per year in the near future. The editor had asked the opinion of The Wistar Institute on a proposal that, if they could see their way clear to publish three volumes a year, the subscription rate to members of the American Institute of Nutrition should be $3.50 per volume; to all others $5.00 per volume. This would represent a discount of 30% instead of the 20% now prevailing for members. Because of the untimely death of Dr. Alfred G. Stengel, who has been acting as director of The Wistar Institute since the death of Doctor Greenman, it was not possible for the Wistar to give a definite answer on this proposal before the Toronto meeting.

A midway position would be to extend the number of pages in each volume to possibly 720 pages instead of 600 as at present with a proportional increase in subscription price. No decision on this matter was reached, but it will obviously come up again at the meeting of the Board next year.

The following data were presented to the Board regarding the number of papers published in the Journal since it last met:

Number accepted	103
Number rejected	50 = 33%
Withdrawn (did not wish to condense)	1
	154

In order to indicate how the new policy adopted last year, of requesting all contributors to condense their material as much as possible, had worked out, the following figures were given:

	Average pages per article
May, 1938	16
June	13
July	14.5
August	13
September	10
	Av. 13.3

	Average pages per article
October	9.8
November	13
December	11
January, 1939	9
February	12
March	10.4
April	13
	Av. 11.1
Average for year	12.2

	Number of articles per volume	
Volume	13	48
	14	51
	15	49
	16	54
	17	55

The new rule obviously could not go into effect immediately after the meeting in Baltimore because papers had already been accepted for issues up to and including September, 1938. Consequently the figures up to this point represent the data previous to application of the rule. From October to April, 1939, they represent data under the new rule. It is evident that there has been a gain in the way of reducing the length of papers, and, it is believed, without injury to the presentation of results. It is evident also that there has been a steady gain in the number of papers published per volume since 1937.

It was the consensus of opinion of those present that continued effort to induce authors to be saving of Journal space as much as possible should be continued.

RESIGNATION OF EDITOR

At this point Doctor Murlin submitted his resignation as editor of the Journal of Nutrition to become effective July 1, 1939. He stated that he was moved to take this action for two reasons. First, because of the by-law prohibiting holding of other offices after the age of 65 and secondly, because he felt that he had served sufficiently long.

A motion was offered by Doctor Brown and seconded by Doctor Hogan that the resignation be accepted with regret but at the same time with appreciation of Doctor Murlin's services.

A procedure for the election of a successor was then adopted. The Board obviously was unprepared to proceed to an election at once. It was agreed that each member of the Board present should canvass active members of the Institute of Nutrition while at the Toronto meeting and then submit to Doctor Murlin by May 8th the names of promising candidates. It was agreed also to have an informal discussion of names suggested at an adjourned meeting on the morning of April 28th.

At this meeting Doctors Chambers and Shaffer of the Editorial Board also were present. Doctor Murlin offered the services of his office as a clearing house for the ballots which would obviously have to be taken by mail. This offer being agreeable, he requested that all members of the Editorial Board submit any additional nominations to him not later than May 8th in order that the election might be completed by July 1st. He agreed to submit as soon as possible thereafter the full list of names to each member of the Board as now constituted for an expression of their first, second and third choice. The first choice would be given a weight of 3, the second a weight of 2 and the third choice a weight of 1. The three candidates having the highest total rating would then be submitted to the Board for a second preferential ballot. If no candidate received a majority vote, the one with the lowest total rating would be dropped and a third ballot taken on the other two.

Respectfully submitted,

L. A. MAYNARD
American Institute of Nutrition

ABSTRACTS OF PAPERS

Relationship between carotene, blindness due to constriction of the optic nerve, papillary edema and nyctalopia in calves. L. A. Moore (introduced by C. A. Hoppert), Dairy Department, Michigan State College, East Lansing.

For the past 20 years various investigators have noted a peculiar type of blindness in calves associated with rations where poor quality or no roughage was fed. Previous work has shown that the blindness is due to a constriction of the optic nerve where it passes through the optic foramen caused by a stenosis of the bony canal. Further work with calves has shown that the blindness is preceded by nyctalopia and ophthalmoscopic observations revealed papillary edema and bleaching of the Tapetum Lucidum. Holstein calves placed on the blindness producing ration and fed crystalline carotene dissolved in cottonseed oil in quantities sufficient to keep the blood plasma carotene level well above a lower limit of 0.13 micrograms per milliliter did not develop these eye changes. Vitamin A deficiency is therefore the causative factor.

In mature cows nyctalopia and papillary edema develop but blindness due to constriction of the optic nerve does not develop due to the fact that the bony optic canal has already been formed. In calves blindness due to constriction of the optic nerve and papillary edema are associated while nyctalopia is a separate process but due to the same deficiency.

Papillary edema is a cardinal sign of increased intracranial pressure. Vitamin A may therefore be necessary for the regulation of this pressure. Increased intracranial pressure may also account for certain nervous manifestations of vitamin A deficiency.

Vitamin A requirements of adults. L. E. Booher, E. C. Callison (by invitation), E. M. Hewston (by invitation), and R. Loughlin (by invitation), Bureau of Home Economics, U. S. D. A., Washington, D. C.

The vitamin A storage of normal well-nourished adults is, on the average, sufficient to prevent detectable signs of nutritional night-blindness for a period of about 1 month. The daily intake of vitamin A which just suffices to maintain normal dark adaptation as determined for five adult subjects varied between the limits of 25 and 55 international units per kilogram of body weight. The daily intake of carotene in cottonseed oil which just suffices for maintenance of normal dark adaptation of adults as measured on ten subjects varied between the limits of 43 and 103 international units per kilogram of body weight. In comparison with cod liver oil, the vitamin A potency of carotene in cottonseed oil was only about 50 to 60% utilized. Further studies have been made in this laboratory to determine the effect of different levels of dietary fat and vitamin B_1 on the utilization of carotene in cottonseed oil for the maintenance of normal dark adaptation of adults. These results do not offer the complete solution to the problem of carotene utilization by adults. Investigation of the total carotene content of peas and of spinach samples in conjunction with simultaneous determination of the international unit values and the minimum vitamin A requirements of adults referred to these same samples of vegetables will be discussed.

Experimental evidence of human riboflavin deficiency. W. H. Sebrell and R. E. Butler (by invitation), National Institute of Health, Washington, D. C.

Eighteen women were given a ration of cornmeal, cowpeas, lard, casein, flour, white bread, sirup, calcium carbonate, tomato juice, cod liver oil, sirup of iodide of iron, ascorbic acid and thiamin chloride. Eleven of the eighteen developed lesions of the lips, angles of the mouth, and seborrheic changes on the nose or ears in from 94 to 185 days. One of the remaining seven started a daily preventive dose of synthetic riboflavin on the one hundred and twenty-ninth day and three on the one hundred and thirty-ninth day. No lesions appeared by the two hundred and twenty-second day.

Six of the women with lesions were given nicotinic acid without benefit. Five then rapidly healed and one slowly improved after the administration of synthetic riboflavin. Treatment was discontinued as soon as healing was complete, and by the two hundred and fourth day lesions had reappeared in three.

The remaining five cases responded to treatment with synthetic riboflavin without nicotinic acid. Treatment was discontinued as soon as healing was complete, and by the one hundred and eighty-sixth day the lesions had reappeared in two.

In the five cases with recurrences the first lesions were completely healed after a total dosage of 11.41 to 34.28 mg. of synthetic riboflavin and there was an interval of 51 to 90 days between the appearance of lesions.

No significant variation in food consumption or body weight was observed during the administration of riboflavin.

Nicotinic acid: its distribution, function and relation to the other members of the B complex. C. A. Elvehjem, Harry A. Waisman (by invitation), and A. E. Axelrod (by invitation), Department of Biochemistry, University of Wisconsin, Madison.

The nicotinic acid activity of a number of foods has been determined by comparing the response made by dogs suffering from black tongue to standard amounts of nicotinic acid and to different levels of the foods tested. Typical results are as follows: liver 1.0 to 1.4, kidney 0.8 to 1.0, lean muscle tissue 0.4 to 0.7, brain 0.4 to 0.5, yeast 0.4 to 0.5, heart 0.2 to 0.3 mg. per gram dry tissue. Wheat germ, milk (fresh and skim milk powder) and dried grass showed a lower potency.

In attempts to determine the physiological activity of nicotinic acid, changes in the cozymase content of tissues from dogs and pigs suffering from nicotinic acid deficiency were studied. The cozymase was determined by the Euler-Myrbäck yeast fermentation method. No consistent variation from the values for normal animals could be demonstrated in the blood, kidney or brain, but the muscle and liver showed very significant decreases. The nicotinic acid necessary to account for the cozymase content of normal tissues agrees in a general way with the amount found in these tissues by animal assay.

Further studies on the differentiation of nicotinic acid from other members of the B complex and the relation of these factors to the optimum utilization of nicotinic acid will also be discussed.

Field studies on the diets of pellagrins. T. D. Spies, J. M. Grant (by invitation) and Martha Hargrove (by invitation), General Hospital, Cincinnati; Hillman Hospital, Birmingham.

The present communication is a report of field studies in which the dietaries of seventy pellagrins (fifty adults and twenty children) were investigated and analyzed. The purpose of these studies was to ascertain the amount and kind of food actually eaten by these persons in the home; to determine existing deficiency states and the actual degree of deficiency; and to apply methods of correction. The diets of these people not only are inadequate in caloric value, but their protein content is low and its biological quality poor. The fat content is very low. While the actual carbohydrate content of these diets is not high, the proportion of calories derived from carbohydrates to those derived from fats is extremely high, a factor which probably results in an increased requirement for vitamin B_1. Aside from the pellagra-preventive factor, vitamin B_1 and riboflavin are probably the outstanding vitamin deficiencies. The calcium, phosphorus and iron content of the pellagrin's diet is low.

The addition of nicotinic acid in adequate amounts to such a diet will protect against certain symptoms, but oftentimes vitamin B_1 and flavin deficiency will develop. Persons who exist on these diets, a representative one of which is shown in the slide, eventually develop pellagra; many of them develop beriberi; and certain of them develop flavin deficiency.

The addition of synthetic nicotinic acid, synthetic riboflavin, and synthetic vitamin B_1 in adequate amounts as daily supplements to the diet eaten by the endemic pellagrins greatly increases their strength, feeling of well-being and ability to work. If nicotinic acid is omitted, the persons are prone to have relapses of the alimentary and central nervous system manifestations of pellagra. If the vitamin B_1 is omitted, they are prone to have relapse of beriberi. If flavin is omitted, they are prone to have recurrences of the manifestations of flavin deficiency

Factors affecting the excretion and requirement of vitamin B_1 in small children. E. M. Knott (by invitation) and F. W. Schlutz, Department of Pediatrics, The University of Chicago.

In vitamin B_1 balance studies, based on 5-day metabolism periods, excretion of the vitamin was about equally divided between urine and feces for preschool children, whereas infants excreted but little in their feces. Although individual differences were encountered, retentions of thiamin were somewhat related to carbohydrate intake and were more definitely influenced by the level of thiamin intake.

When supplements of either thiamin or wheat germ were given to six children receiving basic diets differing in their content of whole grain cereals, the added vitamin usually increased urinary excretion, although individual differences were encountered both in ability to absorb the vitamin and in the amount appearing in the urine. In five out of twelve periods the wheat germ was absorbed slightly less than was the thiamin. In three children poorer absorption was observed when whole grain cereals were included in the basic diet. The more constipated children had a higher fecal excretion presumably due to synthesis of the vitamin since administration of sufficient mineral oil to correct the constipation caused a

50% decrease in the amount of vitamin B_1 in the feces. That the amount of roughage in a child's diet had a definite effect on his ability to digest and absorb vitamin was further illustrated when a milk diet shifted a child's excretion pattern to the infantile type of low fecal and high urinary elimination.

Nutritional cytopenia (vitamin M deficiency) in monkeys receiving the Goldberger diet supplemented with nicotinic acid. P. L. Day, W. J. Darby (by invitation) and W. C. Langston (by invitation), School of Medicine, University of Arkansas, Little Rock.

Young rhesus monkeys were given a diet essentially the same as the Goldberger blacktongue-producing diet no. 268.[1] They developed the syndrome characterized by marked anemia and leukopenia which has been described in monkeys receiving our diet 600.[2] Supplementing the Goldberger diet with 10 or 20 mg. of nicotinic acid daily, or with 20 or 40 mg. of nicotinic acid amide daily did not prevent the cytopenia. Two samples of nicotinic acid were used, one of which had previously been shown to be effective in curing blacktongue in dogs. The simultaneous administration of riboflavin, thiamin chloride and ascorbic acid failed to prevent the cytopenia. However, the diet supplemented with 2 gm. daily of Lilly's liver extract has promoted good growth and maintained a normal blood picture. Likewise, the feeding of liver extract to an animal with profound anemia and leukopenia was followed by a dramatic reticulocyte response and ultimate recovery. We interpret these data to indicate that this blacktongue-producing diet supplemented with nicotinic acid, ascorbic acid, riboflavin and thiamin chloride is deficient in some factor essential to the nutrition of the monkey. We have previously termed this factor vitamin M.

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[1] Goldberger, J., and W. H. Sebrell, Pub. Health Rep., U. S. P. H. S., vol. 45, p. 3064 (1930).

[2] Langston, W. C., W. J. Darby, C. F. Shukers and Paul L. Day, J. Exp. Med., vol. 68, p. 923 (1938).

The lability of the basal metabolism in growing rats. T. S. Hamilton, Animal Nutrition Division, University of Illinois, Urbana.

The basal metabolic rates of nearly 300 growing rats, under rigidly controlled conditions, were determined. The average basal metabolism of growing male rats fed well-balanced diets was 773 calories per 24 hours per square meter of body surface. Variations between 600 and 1000 calories were encountered, often in the same rat in less than 4 weeks' time. Using 1) pair mates gaining at different rates on the same amounts of different diets, 2) pair mates gaining at the same rates on different amounts of different diets, and 3) pair mates gaining at different rates on different amounts of the same diet, it was found that the chief factor affecting the B.M.R. of growing rats was the previous (21 days) caloric intake. The correlation between previous caloric intakes and basal metabolic rates, both expressed in calories per square meter per day was, for 228 rats, +0.706. The following factors were eliminated as factors of any great importance in affecting the B.M.R. of the rats studied: 1) the protein content of the diet, 2) the total amount of protein consumed, 3) rate of growth (although no rat studied had been losing weight), 4) composition of rat, 5) activity of rat and 6) temperature of environment.

Chemistry of the essential fatty acids. G. O. Burr, J. B. Brown, J. P. Kass (by invitation), and W. Lunberg (by invitation), Department of Botany, University of Minnesota, Minneapolis.

During the past year an intensive study has been made by a group here of the chemistry of the fatty acids which will cure fat-deficient rats. With natural oils, fatty acid concentrates and pure fatty acids comparative studies have been made. Acids from several sources have been used in the search for evidence of isomeric forms of special value. Especial emphasis has been laid on linoleic acid because of the many statements about natural isomeric forms. Our evidence indicates that there is only one widely distributed linoleic acid in seeds. Isomeric forms have been synthesized and they have all been inactive nutritionally. The isomer found in butter is probably less active than the common plant acid. Furthermore, linoleic acid is more useful in curing and preventing fat deficency than either linolenic, arachidonic or the other higher unsaturated acids in fish oils.

Methods of analysis have been carefully checked, and it has been found that the thiocyanogen calculation for linoleic acid is not a reliable measure of the curative value of all oils.

Some observations on the effects of low levels of dietary protein. A. U. Orten (introduced by A. H. Smith), Laboratory of Physiological Chemistry, Yale University, New Haven; and Department of Physiological Chemistry, Wayne University College of Medicine, Detroit, Michigan.

The effects of a chronic protein deficiency on both young and adult rats have been studied. The animals were fed a synthetic diet low in protein of excellent quality (lactalbumin 3.5 or 5%) with an abundance of all known essential factors other than protein.

The adult female rats given a low-protein diet remained in good condition for more than 4 months. No gross abnormalities were noted other than a striking tendency toward obesity. Further lowering of the protein caused a loss of weight and cessation of the oestrus cycle.

At 100 days of age, animals fed the low-protein diet from weaning were in good condition and resembled 30-day-old normal rats. However, they exhibited an hypochromic anemia characterized by a nearly normal erythrocyte count, a low hemoglobin, and an increased reticulocyte count. They showed slight, if any, evidence of sexual development. At autopsy the ovaries and reproductive tract were found to be infantile. Treatment with gonadotropic hormone and pituitary assays indicated that the pituitary rather than the ovary was at fault. Fatty livers and stomach ulcers were also observed, particularly in the adult animals. Findings in calorie, age and weight control groups indicated that the foregoing abnormalities are referable to the low protein content of the diet rather than to a diminished intake of calories or of other factors.

The effect of heat and hydration on the nutritive value of soy bean proteins. H. T. Parsons, A. L. Marlatt (by invitation), D. Johnson (by invitation), and C. Gray (by invitation), Nutrition Laboratory, Department of Home Economics, University of Wisconsin, Madison.

Gradated increases in the degree of heat treatment of soy beans resulted in increases in the nutritive value of the protein, for rats, up to short periods of

autoclaving. Beyond this point, however, increases in the time or the temperature of autoclaving resulted in progressive losses. The poor results were not attributable to lack of the B complex in the ration as 'Vitab' produced no improvement; all rations were supplemented with thiamine. The addition of lysine was also without beneficial effect. Soaking the beans before boiling or autoclaving had a detrimental effect.

The effects of roasting depended upon how this was carried out; roasted, ground soy beans were practically no better than raw, whereas whole soy beans roasted at 150° for 30 minutes were more efficient than after some degrees of autoclaving. This pronounced effect of some relatively slight differences in hydration during heating and the tendency for prolonged autoclaving at high temperatures to be detrimental may explain the occurrence of discrepancies in the results of previous studies from various laboratories on the effect of heat on soy bean protein. The variety of soy bean, on the other hand, probably has had little significance in such differences since the comparative effects of various heat treatments were very similar for five varieties of dry mature soy beans and for six green garden varieties.

The amino acid composition of the proteins of cow and human milk. E. F. Beach (introduced by Icie Macy Hoobler), O. Hoffman (by invitation), and S. S. Bernstein (by invitation), Research Laboratory, Children's Fund of Michigan, Detroit, Michigan.

A fundamental consideration in determining the nutritive value of proteins is their content of various amino acids. We have prepared two protein fractions from samples of cow and human milks; casein by isoelectric precipitation and soluble-protein by precipitation from the whey at a concentration of 8% trichloracetic acid. These fractions were analyzed for basic amino acids by the Block method and for tyrosine and tryptophane by the method of Folin and Marenzi. The distribution of total nitrogen between casein, 'soluble-protein' and non-protein nitrogen in the various samples of milk was determined.

Cow's milk contained 494 mg. per cent protein nitrogen of which 405 were casein and 89 were 'soluble-protein' nitrogen. Human milk contained 126 mg. per cent protein nitrogen of which 49 were casein and 77 were 'soluble-protein.' The amino acid distribution in cow's milk was: histidine, 55.6; arginine, 114.5; lysine, 207; tyrosine, 192.2 and tryptophane, 39.6 mg. per cent. In human milk the distribution was: histidine, 10.5; arginine, 31.4; lysine 42.4; tyrosine, 44.1; and tryptophane, 11.5 mg. per cent.

Although cow's milk has approximately four times the protein concentration of human milk, the amino acid distribution in the proteins is similar. On the basis of five amino acids, the total protein of the two milks have equal nutritive value. The methionine and cystine distributions will be reported.

The purine metabolism of the Dalmatian dog. H. C. Trimble, Biochemical Laboratory, Harvard Medical School, Boston.

Adult male Dalmatian dogs on a purine-free diet excrete uric acid at the rate of 35 mg. per kilogram per day. Females averaged about 5 mg. less. Growing puppies excrete uric acid from birth, even before the spots appear. During the period of active growth the excretion rate of puppies is 50 to 70 mg. per kilogram

per day. In adults increasing the carbohydrate, fat or protein content of the diet has not produced significant increases of uric acid output. In adults the output of allantoin has been observed to range from 20 to 50 mg. per kilogram per day. Increases of carbohydrate or fat have not enlarged allantoin output while increases of protein have been accompanied by very definite enlargements. Intravenous injections of uric acid have had very little effect upon allantoin output and the uric acid has been recovered quantitatively. These findings favor the conclusion that uric acid and allantoin are not completely intereonnected with respect to their metabolism in the Dalmatian dogs. Supporting this conclusion are observations (preliminary reports of which have been made) upon the effects of total absence of the liver and upon the presence of uricase in the liver of Dalmatians.

An improved synthetic ration for the chick. A. G. Hogan and L. R. Richardson (by invitation), Department of Agricultural Chemistry, University of Missouri, Columbia.

Our first synthetic rations became undependable after a time and it developed that the liver extracts, obtained from various commercial sources, were of uneven usefulness for our purpose. We then began preparing them in the laboratory and these extracts were equal or superior to the best that had been previously available. Growth is normal and leg deformities are infrequent. Apparently the incidence of these abnormalities is independent of the amount of manganese in the ration.

In the original procedure liver was first extracted with strong alcohol and the extract adsorbed with fuller's earth. On a dry matter basis the filtrate made up 6% of the ration and the adsorbate was supplied in an equivalent amount. The liver residue was then extracted with water and this extract made up 6% of the ration. This extract is the most important and may be the only fraction that is essential. The other vitamin carriers are 8% of soy bean oil and 2% of cod liver oil. The liver residue still contains a substance of importance in chick nutrition and when the ration contains 10% of this material the rate of growth is remarkably rapid.

A chronic congenital ataxia and osteodystrophy in chicks due to manganese deficiency. L. C. Norris and C. D. Caskey (by invitation), Department of Poultry Husbandry, Cornell University, Ithaca, N. Y.

In studies on the role of manganese in the reproduction of the domestic fowl an ataxia was observed in the chicks of the hens fed a diet containing approximately 6 μg. of manganese per gram but no ataxia was observed in the chicks of hens fed higher levels. The ataxia accompanied the osteodystrophy which usually develops in the chicks of hens on this dietary regime. The chief symptoms of the ataxia were incoordination of head movements and gait; those of the osteodystrophy shortening of the bones of the legs and wings. Some of the head movements of the ataxic chicks were similar to those in polyneuritis.

Many of the ataxic chicks survived when fed a diet adequate in manganese but complete recovery was not made from either the ataxia or the osteodystrophy.

Normal chicks were hatched from the eggs of the ataxic pullets reared to maturity upon being artificially inseminated with the semen of ataxic cockerels. Therefore, the chronic ataxia and osteodystrophy in the pullets did not affect their ability to metabolize manganese and to produce normal offspring.

The ataxia was not cured by injection of manganese or thiamin or both manganese and thiamin. In a preliminary histological examination of the brains of ataxic chicks a marked reduction in the number of Purkinje cells of the cerebellum was observed. If this observation is confirmed, it offers an explanation of the inability to cure the ataxia.

The copper metabolism of young women. R. M. Leverton (introduced by L. J. Roberts), Department of Nutrition Chemistry, University of Nebraska, Lincoln.

Twenty-four 1-week metabolism studies which involved the weighing and analyzing of all the food eaten and the collection and analysis of all the excreta were made of young women between the ages of 16 and 25 years on self-chosen diets. The biological materials have been analyzed for calcium, phosphorus, nitrogen, iron and copper.

The average daily intakes of copper ranged from 1.4 to 3.6 mg. with an average of 2.5. The daily fecal excretions ranged from 1.2 to 2.5 mg. with a mean of 1.8. The daily urinary excretions ranged from 0.025 to 0.320 mg. with an average of 0.20. The average daily balances ranged from a retention of 1.8 mg. of copper to a loss of 0.5 mg. with an average of a positive 0.56. There were nineteen cases of storage of copper and five cases of negative balance.

There was a relation between the level of copper intake and the amount of copper stored. Whenever the copper intake was 2 mg. or more per day there was retention and whenever the intake was less than 2 mg. there was a negative balance. Indications are to the effect that a maintenance allowance of copper for girls between the ages of 16 and 25 may be 2 mg., but that if more is present in the diet it will be stored.

The effect of apple constituents on the retention by growing rats of lead contained in spray residues. J. B. Shields (by invitation), H. H. Mitchell, and W. A. Ruth (by invitation), Animal Nutriton Division, University of Illinois, Urbana.

The purpose of this experiment was to obtain data on two points: Is there a difference in the retention of lead from spray residues and from acid lead arsenate? and Does the presence of apple constituents in the diet affect the retention of lead?

The experiment was carried out as a triplicate comparison. Twelve trios of young litter mate albino rats were equated according to weight and sex. Equalized feeding was used. In each trio one rat received a diet containing 32% of dried apple powder from unsprayed apples, the second a similar diet using sprayed apples as a source of apple powder and the third a diet in which the apple powder was replaced with starch and agar. Lead arsenate was added to diets 2 and 3 to equal the lead content of 33 parts per million in the sprayed apple powder diet. The rats were fed 1000 gm. of food, sacrificed and the complete carcass was analyzed for lead.

The results showed a significantly higher storage of lead in the rats which did not receive any apple powder. There was no significant difference between the other two series of rats. The average retentions of lead were 0.329 mg. for the rat receiving sprayed apple powder, 0.346 mg. for the rat receiving unsprayed apple powder and 0.536 mg. for the rat receiving no apple powder.

A quantitative study of the limitation of fluorine toxicosis with aluminum. W. E. Anderson and J. L. Melnick (by invitation), Laboratory of Physiological Chemistry, Yale University, New Haven.

The inhibition of aluminum salts on the toxic activity of fluorine has been observed by Sharpless and later by Kempf and co-workers. From our study evidence was obtained with rats to show quantitative relations between absorption of fluorine and level of aluminum in the diet.

To a fluorine-free basal ration, 0.0313% of fluorine and 0, 1, 10 and 40 equivalents of aluminum were added. Determinations of fluorine were made in the whole body tissue and in feces and urine.

When no aluminum was added to the diet containing fluorine, the fluorine content of the body tissue was about 200 p.p.m. As the dietary aluminum was increased to 40 equivalents the above figure fell to 35 p.p.m., and at this higher level of aluminum intake, the percentage of ingested fluorine increased nearly tenfold in feces, whereas urinary fluorine decreased in a corresponding manner.

ABSTRACTS OF PAPERS READ BY TITLE

Dynamic effects of nutrients, singly and in combination. E. B. Forbes, J. W. Bratzler (by invitation), and E. J. Thacker (by invitation), Institute of Animal Nutrition, Pennsylvania State College, State College.

Two similar programs of experimentation were conducted with albino rats for the purpose of determining the dynamic effects of beef muscle protein, dextrin and lard, individually and also with the three combined.

The nutrients studied were fed in addition to a basal maintenance ration of wheat, milk powder and NaCl.

Each of the experimental programs consisted of two parallel series of tests, one on 100 gm. rats and the other on rats weighing about 240 gm. A separate group of five rats, at the standard live weight, was used for each test.

Calorimetric periods were 7 hours long, the first hour's measurements and those of any other periods during which there was considerable activity were excluded.

In seven treatments among eight the heat increments were the higher with the younger rats.

In both series of tests, and with both ages and weights of subjects, among the single nutrients the dynamic effect of the beef muscle protein was always much the highest, that of the dextrin was always intermediate and that of the lard was always much the lowest.

In every case the dynamic effect of the mixture of the three nutrients was much lower than the combined individual effects, and in three groups of tests among the four the dynamic effect of the mixture was virtually identical with that of the lard.

Production and cure of a nutritional microcytic hypochromic anemia in dogs. O. M. Helmer (by invitation), P. J. Fouts (by invitation), S. Lepkovsky, and T. H. Jukes, Lilly Laboratory for Clinical Research, Indianapolis City Hospital, Indianapolis and the Division of Poultry Husbandry, University of California, Berkeley.

Puppies and adult dogs fed a synthetic diet apparently deficient only in factor I (rat antidermatitis factor, vitamin B_6) all developed a microcytic hypochromic anemia. Loss of appetite, loss of weight and constipation accompanied the anemia. Convulsions occurred at height of anemia in three of the puppies. Addition of iron and copper to diet did not cure the anemia or prevent its increase or development. Administration by mouth of a rice polish extract containing factor I, or crystalline factor I (60 micrograms per kilo per day) was followed by a rise in reticulocytes and rapid cure of anemia, increase in appetite, gain in weight and improvement in general condition of dogs.

The specific dynamic effects of glycine, alanine and glutamic acid. M. Kriss, Institute of Animal Nutrition, Pennsylvania State College, State College.

The specific dynamic effects of glycine, alanine and glutamic acid were determined with rats when each of these amino acids was fed as a supplement to a basal maintenance ration in quantities supplying 7.5 kilogram-calories of gross energy per day, the heat production of the animals while on the maintenance ration being used as the base value. In a similar manner the specific dynamic effect of glycine was determined when it was fed in a quantity supplying 5.6 kilogram-calories per day. The dynamic effects were expressed, for comparative purposes, 1) per gram of amino acid fed, 2) per gram of amino acid deaminized, 3) per millimol of amino acid deaminized, 4) as per cent of gross energy, and 5) as per cent of metabolizable energy.

Glutamic acid exerted the greatest dynamic effect.

The dynamic effect of alanine was nearly identical with that of glycine, when expressed as per cent of metabolizable energy, but it was considerably greater than that of glycine when expressed in any other way.

The dynamic values of glycine were slightly greater at the higher level of feeding than at the lower level.

The greatest differences among the dynamic values of the different amino acids were obtained when the effects were expressed per millimol of amino acid deaminized. The smallest differences were observed among the dynamic values expressed as per cent of metabolizable energy.

The basal metabolism of the rabbit. Robert C. Lee (by invitation), Nutrition Laboratory of the Carnegie Institution of Washington, Boston, Massachusetts.

The basal metabolism was established by 196 experiments with thirty-four adult rabbits of different breeds. Their range in weight (1 to 7 kg.) enabled a study of the influence of size upon metabolism within the same species. In ascertaining the conditions required to obtain basal metabolism measurements on rabbits, the zone of thermic neutrality was found to be from 28° to 32°C., but a period of adjustment to this temperature was necessary prior to the experi-

ment. Fasting 24 hours did not insure a respiratory quotient of fat, but the heat production remained essentially constant between the twenty-fourth and the seventy-second hour of fasting. Time of day had no influence. The standard deviation of the individual values from the average for each animal was ±6.9%. The basal heat production of rabbits cannot be expressed as a single average value, either per unit of weight or of surface area. The total heat production per 24 hours increases as a straight-line function of the weight, from 60 calories for 1-kg. rabbits to 300 calories for 7-kg. rabbits. Expressed on the basis of the two-thirds power of the body weight (surface area), the heat production increases from 600 to 816 calories per 24 hours between 1 and 7 kg., respectively.

The basal metabolism in pregnancy. G. MacLeod, C. Taylor (by invitation), E. Robb (by invitation), D. Baker (by invitation), M. O'Donahoe (by invitation), and P. McCrery (by invitation), Nutrition Laboratory, Teachers College, Columbia University, New York.

Determinations of the basal metabolism of four primipara have been made at frequent intervals during pregnancy and for varying lengths of time following delivery. In each case the basal metabolism had been determined before onset of pregnancy. Two of the four subjects were also followed through their second pregnancy. Blood pressure, vital capacity, pulse rate, respiration rate, sub-lingual temperature, sitting and standing heights and body weight (in indoor clothing without shoes) were determined routinely at the time of each determination of the basal metabolism. The Collins Benedict Roth, Sanborn Benedict and Benedict Student Respiration Apparatus have been used.

Comparisons of the basal metabolism just preceding the birth of the baby with the pre-pregnant figures show increases in calories per square meter per hour ranging from 15.6 to 23.4%, in calories per 24 hours ranging from 23.2 to 29.7%, with increases in body weight ranging from 9.1 to 25.4%.

The vital capacity, blood pressure and pulse rate show considerable fluctuating during the course of pregnancy in these four subjects. Curves will show the order of magnitude of these fluctuations and their general trend.

Physiological properties of ascorbic acid. E. W. McHenry and M. Sheppard (by invitation), School of Hygiene, University of Toronto, Toronto.

In paired feeding experiments in guinea pigs a deficiency of ascorbic acid causes a loss in weight which is accompanied by an increase in metabolic rate and a decrease in water retention. Despite the increase in metabolic rate the body fat of the deficient animals is significantly greater than in the supplemented controls. No great difference in protein or ash was observed. The changes in metabolism have been studied also in balance experiments during which animals developed ascorbic acid deficiency and were subsequently treated with the vitamin until recovery to normal was secured.

Calcium utilization in pre-school children. H. B. Pierce, R. G. Daggs, A. B. Meservey (by invitation), and W. J. Simcox (by invitation), Departments of Biochemistry and Physiology, College of Medicine, University of Vermont, Burlington.

The object of this study has been to determine the utilization of calcium and phosphorus when supplied chiefly in milk and when 200 mg. of milk calcium have been replaced with tri-calcium phosphate. Two groups of children, each comprised of two girls and three boys, served as subjects for 6 months. Five experimental periods were devised: 1) Period (6 weeks) in which children on entirely adequate diet were saturated with calcium by adding calcium lactate to basal diet, 2) period (5 weeks) in which calcium was supplied chiefly by milk, 3) period (2 weeks) in which calcium intake was reduced to approximately two-thirds that of period 2, 4) period (4 weeks) of resaturation where same amount of calcium as supplied by lactate was added in form of tri-calcium phosphate to basal diet, and 5) period (6 weeks) in which 200 mg. of milk calcium daily were replaced by equivalent amount in form of tri-calcium phosphate. With one group of children, sequence of periods was as outlined above, and with second the sequence was reversed.

At beginning of study, it was found that calcium retention was high but decreased and became fairly uniform after 3 weeks. When 200 mg. of milk calcium were replaced by the salt, the Ca and P of the latter were utilized as well, if not better than when supplied in milk.

Metabolism of food citrate by infants. A. H. Smith, L. C. Bauguess (by invitation), and D. J. Barnes (by invitation), Department of Physiological Chemistry, Wayne University College of Medicine and Harper Hospital, Detroit.

The present report deals with the metabolism of food citrates in thirteen human infants ranging in age from 3 to 14 months and maintained under carefully controlled experimental conditions. Urine and feces were collected separately and citric acid was determined on food and excreta. The experimental periods were of 3 days duration, each such period being followed by a period of 4 days when no collections were made. An adequate diet of cereal, milk, lactose and strained vegetables supplemented with ascorbic acid and vitamins A and D provided from 1415 to 3379 mg. daily of citrate, depending on the food intake. Citric acid corresponding to 4 to 20.5% of the ingested citrate was found in the excreta. In general, more citric acid appeared in the urine than in the feces, the renal excretion ranging from 3.9 to 13.3% of the daily ingested citrate in eleven of the subjects. The dietetic and metabolic significance of the observations will be discussed.

ABSTRACTS OF SYMPOSIUM PAPERS

"The fortification of foods with vitamins and minerals

Basic nutrition principles involved in the fortification of foods. Agnes Fay Morgan, University of California, Berkeley.

Our modern civilization has largely taken away from the food supply the qualities of wholeness and freshness which are essential for optimum nutrition. An ideal solution of the food problem thus presented would be the return of these qualities through changes in methods of processing and distributing. Failing this, artificial additions of vitamins and minerals sufficient to restore the amounts originally present might be allowed or even demanded.

The addition of excessive amounts of non-indigenous kinds of these substances to foods may be dangerous because of the possible resultant lighting up of latent deficiencies of other and perhaps unknown kinds.

The dangers of excess of vitamin D and of nicotinic acid have been plainly indicated and their use in fortifying foods should be handled with extreme caution.

The use of fortified foods and vitamin concentrates may be desirable in restricted diets and for certain diseased and unusual conditions. In digestive failures, lactation and possible pregnancy, alcoholism, diabetes, cardiac and renal disease, reduction diets and for infants fortification may be needed. To combat in the general population the 'perverse' use of vitamin-poor foods such as sugar, white flour, polished rice, alcoholic and soft drinks, fortification of these foods may be desirable until the slow process of education relegates the demand for them to the background.

Fortification of foods in a general program for better nutrition. Lydia J. Roberts, The University of Chicago, Chicago, Illinois.

Available evidence indicates that the diets of many American people are deficient in calcium, B_1 and the pellagra preventive factor, as well as in other dietary factors. The ideal method of effecting improvement would seem to be to increase the use of the protective foods and to return to some extent at least to a larger use of less highly milled cereals and other refined foods. A long educational program would be required to accomplish this end. A supplementary program of fortification might well be used as a first-aid measure, if leadership could be kept in the hands of nutrition specialists and physicians so that the public would be properly safe-guarded against exploitation. Such fortification might well include the addition of vitamin B factors to cereals, vitamin A to all butter substitutes, and similar supplementation of natural carriers. Such fortification should be without additional cost to the consumer if it is to accomplish its end, for the lower income groups are most in need. Whatever is done in fortification should be considered as only supplementary to the program of popular education toward the improvement of the diet along the lines indicated as desirable. There may still be essential dietary factors of which we are as yet unaware and we cannot trust solely to fortification but must put our major faith in a varied diet containing generous amounts of natural foods.

The public health aspects of the fortification of foods with vitamins and minerals. W. H. Sebrell, U. S. Public Health Service, Washington, D. C.

Since the purpose in fortifying foods with vitamins and minerals is to prevent the deficiency diseases, the question is discussed from the point of view of the practical value, desirability and efficiency of fortification in this respect. It is pointed out that, with the exception of vitamin D milk, which is regarded as a valuable and desirable product for infants in some areas, the fortification of foods is undesirable from the public health point of view for several reasons. The cost of fortification would tend to put these foods beyond the reach of the lowest income groups which have the highest proportion of deficient diets. It would be wasteful because the fortified products in all probability would be purchased by people not needing them. There is no method of selecting foods to be fortified and there is not sufficient information available on what vitamins or minerals are most needed or on the proper quantity to add. The desired objective can be attained more cheaply and more satisfactorily by the use of a varied diet consisting mostly of natural unrefined foods. It is also pointed out that it is better public health practice to advocate the use of a varied diet in preference to fortified foods, since our deficiency disease problem is a vague one and deficient diets usually are found to be deficient in several respects.

Governmental control problems in the fortification of foods. E. M. Nelson, Food and Drug Administration, Washington, D. C.

Practically all aspects of the desirability of fortifying foods with vitamins or minerals have long been problems of the Food and Drug Administration in considering the propriety of the representations that have been made for various vitamin and mineral preparations. Successful sales promotion of such products depends on the extent to which representations can be made that our dietaries do not supply certain food essentials in adequate amounts and also on the representations which can be made with respect to the nature of the ills or conditions which result from such deficiencies. The Food, Drug and Cosmetic Act, which was passed last year, will require more informative labeling of food products which may be fortified with vitamins or minerals. Extensive fortification of foods may possibly lead to increased and more difficult problems of control from the standpoint of assuring the consumer that the product has the vitamin content claimed. That, however, should be no deterrent if there is satisfactory evidence that an important portion of our population would benefit from such vitamin additions to staple food products. In our control work we are conscious of an extensive, rapidly growing and constantly changing industry in vitamin preparations. It is estimated that during the year 1938 more than $100,000,000 were spent for vitamin preparations by the people of the United States. Generalizations with respect to the need for fortfication of our foods frequently lead to errors. It seems desirable to consider each vitamin or mineral and each food which may be fortified, individually. Deficiencies are most likely to occur among the low-income groups, and these groups should be given prime consideration. Investigators in the field of nutrition should exert care in the wording of statements so that they do not inadvertently foster commercial practices in the exploitation of special products rather than perform a service to the general public.

Retention, restoration and fortification of vitamins in foodstuffs. Alonzo E. Taylor, General Mills, Inc., Minneapolis, Minn.

Treatment of vitamins in foodstuffs is described under retention, protective restoration, and fortification. Natural vitamins should be retained in processing whenever practicable, but this is impracticable with certain staples such as refined sugar and white flour. Whenever retention is impracticable, processors should seek restoration, either with natural or synthetic vitamin. Such restoration ought not to exceed top limit of natural occurrence. Fortification should be reserved for special instances. Restoration of vitamin B_1 and B_2 in processed grains is technically practicable, but at present prohibitively expensive. Restoration of vitamin A in milk or butter is technically practicable and not inordinately expensive. In case of vitamin D restoration in milk and butter gives too low an intake; restoration in yolk of egg is practicable but not adapted to wide usage. To make commercial milk protective without use of fish-liver oil requires fortification with vitamin D concentrate, which is practicable and not inordinately expensive. Restoration with vitamin C would not now seem necessary, since retention is successfully accomplished. Our knowledge of nicotinic acid and vitamin E is too fragmentary to admit of discussion, under headings of retention, restoration or fortification.

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